NOTAS SOBRE

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# Consumption of muscovy duck eggs by brown capuchin monkeys in a peri-urban forest in the Amazon

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**ABSTRACT**
We report the capture and consumption of muscovy duck *Cairina moschata* (Linnaeus, 1758) eggs by brown capuchin *Sapajus apella* (Linnaeus, 1758) in a peri-urban environment close to Porto Velho city, Brazil. We observed a young brown capuchin taking two eggs from a nest. It positioned one egg between the lags, biting it with the canine tooth, bringing it to the mouth, and turning to suck out the content. This is the first report with detailed information on how brown capuchins monkeys capture and consume eggs. Consumption of domestic animals can represent a threat since brown capuchins monkeys can be retaliated for that.

**Keywords**: diet, land use, nest predation, Rondônia, vocalization

**RESUMO - Consumo de ovos de pata doméstica por macaco-prego na floresta peri-urbana da Amazônia.** Relatamos a captura e consumo de ovos de pata doméstica *Cairina moschata* (Linnaeus, 1758) por macaco-prego *Sapajus apella* (Linnaeus, 1758) em um ambiente peri-urbano próximo à cidade de Porto Velho, Brasil. Observamos um jovem de macaco-prego tirando dois ovos de um ninho. Ele posicionou um ovo entre os membros posteriores, mordendo-o com o dente canino, levando-o até a boca e virando para sugar o conteúdo. Este é o primeiro registro com informações detalhadas sobre como os macacos-prego capturam e consomem os ovos. O consumo de animais domésticos pode representar uma ameaça, já que os macacos-prego podem ser retaliados por isso.

**Palavras-chaves**: dieta, predação do ninho, Rondônia, uso do solo, vocalização

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Capuchin monkeys (genus *Sapajus*) are very plastic, omnivorous, and generalist in their diet, including plant resources, invertebrates, eggs, and vertebrates (Freese & Oppenheimer 1981; Cockle et al. 2016; Falótico 2023). Regarding vertebrates, observations report the predation and consumption of reptiles and amphibians (Izawa 1978; Falótico et al. 2018), birds (Ferreira et al. 2002), terrestrial mammals (Galetti 1990; Resende et al. 2003; Milano & Monteiro-Filho 2009), bats (Falótico 2023), and even primates (Sampaio & Ferrari 2005; Carretero-Pinzón et al. 2008; Albuquerque et al. 2014). In addition, nests-egg predation has been documented in the canopy (Cockle et al. 2016; Menezes & Marini 2017) and terrestrial nests (Torralvo et al. 2017).

Therefore, the number of prey items for capuchin monkeys is a response to their ability to search (Terborgh 1984). In the canopy, they usually tap old branches to investigate potential prey presence (Izawa 1978). On the ground, capuchins turn over leaves, twigs, and stones, searching for any prey (Fragaszy et al. 2004). Further, recent observations report capuchin monkeys using tools to seek out and capture prey hidden in stone shelters (Falótico 2023).

However, most observations of predation on vertebrates seem to be opportunistic. Thus, the ability to search and capture seems crucial to predation events (Fragaszy et al. 2004). Besides, the environment can play an important role due to the availability or constraints of resources. Here we report the capturing and consumption of muscovy duck *Cairina moschata* (Linnaeus, 1758) eggs by brown capuchin monkey *Sapajus apella* (Linnaeus, 1758) in a peri-urban environment. We then briefly discuss previous records, the foraging strategies of the primates observed, what might favor this behavior, and the implications of continuous forest loss in these events.

The observations have been made opportunistically during a course on bat and insect capture techniques in the Centro de Cultura e Formação Kanindé (CCFK; Kanindé Center, or Center hereafter), placed in a peri-urban region of Porto Velho city (Rondônia, Brazil), at the kilometer 14$^{th}$ of the way to Areia Branca (latitude -8.897960; longitude 63.896873) (Fig. 1). The CCFK has a forest fragment (ca. 161 ha) relatively well connected to other forest remnants. The CCFK is a natural and well-structured ombrophilous forest with the presence of bamboo (Fernandes & Guimarães 2002), surrounded by a matrix of pasture and crops, mainly for cattle and cassava production. In addition to the brown capuchin monkey, the area is home to eight primate species: Purús red howler monkey *Alouatta puruensis* Lönnberg, 1941, black-headed night monkey *Aotus nigriceps* Dollman, 1909, black-faced black spider monkey *Ateles chamek* (Humboldt, 1812), Rondon's marmoset *Mico rondoni* Ferrari et al., 2010, Mittermeier's Tapajós saki *Pithecia mittermeier* Marsh, 2014, brown titi monkey *Plecturocebus brunneus* (Wagner, 1842), Weddell's saddle-back tamarin *Leontocebus weddelli* (Deville, 1849), and golden-backed squirrel monkey *Saimiri ustus* (I. Geoffroy St.-Hilaire, 1843). The target species present a relatively high density (0.7 ind/10 km), according to Silva et al. (2021).

In the east portion of the CCFK, there are administrative and rural buildings, where local administration raises domestic chickens and ducks for training courses and en-

tertainment for visitors. The specific event site is an open area (~50m$^2$) with sparse trees (*Mangifera indica* L. and *Bertholletia excelsa* Humb. & Bonpl.), no understory or herbaceous layer, exposed soil, and a hen house (10 x 3 m) positioned near the forest edge. According to Köppen's climate classification map (Alvares et al. 2013), the local climate is classified as Am, with 26°C of mean annual temperature, annual precipitation above 2,000 mm, and less rainy months in the winter.

The event took place on September 4, 2022, at 15h17. We observed a mixed group of brown capuchin monkeys (an adult, two subadults, and two young) and golden-backed squirrel monkeys; ca. 13 individuals) close to the CCFK administration, foraging in the forest edge, mainly on two trees of tucumã palm *Astrocaryum aculeatum* G. Mey. The golden-backed squirrel monkey individuals were moving at 12 m height, while brown capuchin monkey individuals were exploring a tucumã palm tree at lower strata (ca. 3 m height) and kept moving forward ca. 20 m from the previous point to densification of açaí palm *Euterpe oleracea* Mart. and bacaba palm *Oenocarpus bacaba* Mart. A young brown capuchin monkey remained in the last place, moving to a mango tree with accumulated leaves in its base and an abandoned door leaning against the trunk, a location that is used continuously by ducks for oviposition (Fig. 2). This individual remained for 4 min in a trunk bifurcation until the group started to explore the açaís and bacabas. Then, this individual descended to the ground and remained behind, below the door for ca. 1 min. After this period, the young return to the tree, climbing the door, carrying two eggs (one in each hand), and stopping at ca. 5 m height. In the sequence, the individual positioned one egg between the lags, biting it with the canine tooth at the extreme of the egg, bringing it to the mouth, and turning to suck out the content (Fig. 2; https://youtu.be/XgFIMRi2Yys). The young repeated this movement until it fully opened the egg, inserting its hand to inspect the inside. The individual then repeated this sequence with the second egg. During the event, the young did not emit any vocalization.

At 16h48, a subadult brown capuchin monkey that was in the açaís and bacabas returned to the mango tree. At this time, the group was ca. 200 m apart. The subadult also descended and collected an egg without stopping, as did the young. As the individual moved, observers could not see egg consumption. Like the young, the subadult did not vocalize during its egg capturing. No remains of the consumed eggs were located, and all the eggs in the nest were predated, so it was not possible to assess their preservation status.

To date, this is the first report with detailed information on how capuchins monkeys capture and consume eggs. Previous records observed nest predation or egg capturing without recording how capuchins monkeys consumed the captured eggs (see Cockle et al. 2016; Menezes & Marini 2017; Torralvo et al. 2017). Nonetheless, the number of reports on predation events and search technics increases only when considering the different genus species (e.g., Albuquerque et al. 2014; Torralvo et al. 2017; Falótico 2023). This low number of events seems to be the result of difficulties in observing the nest predation during field sampling. The same occurred in the current report when we did not observe the egg consumption by the second individual

as it moved toward the dense forest. In addition, nest predation events commonly occur with solitary individuals, which does not guarantee the observation by the researcher (also commonly solitary) during field sampling.

The searching strategy during events of predation is also complex. Terborgh (1984) noticed that capuchins monkeys are better at searching than persecuting during predation, and then the number of individuals plays a role. Although capuchins move in groups while foraging, most predation events occur with the involvement of isolated individuals (Fragaszy et al. 2004). We also observed isolated individuals, in addition to the detail of silent nest predation events. Capuchin monkeys have a highly complex and varied vocal repertoire, with 25 types of vocalizations recorded for bearded capuchin *Sapajus libidinosus* (Spix, 1823) (Lisboa et al. 2021) and 29 for blonde capuchin monkey *Sapajus flavius* (Schreber, 1799) (Bastos et al. 2015). Both studies highlight the occurrence of specific vocalizations used in situations involving the search for or associated with food. Thus, individuals of the group are alerted regarding the presence and location of the food source. Foraging in silence may be an artifact to avoid detection by the potential prey, other group members, and their contest for the item.

Different habitat conditions, likewise, are inevitably a variable to consider. Beltrão-Mendes et al. (2011) hypothesize that buff-headed capuchin *Sapajus xanthosternos* (Wied-Neuwied, 1826), for instance, is limited to occur in remnants larger than 150 ha, which can be a limit to congeners. Thus, exploring specific items can be valuable as the remaining habitat shrinks or becomes resource-poor and anthropic effects increase. In consequence, predation events can increase and result in a high impact on the potential prey community. For example, reduced forest fragments with anthropic disturbance or resource-poor can enhance the capture of marmosets by capuchins monkeys (Albuquerque et al. 2014; Costa et al. 2020). In urban habitats, human provisioning increments the diet with calorie items (but non-nutritive), which can alter the minimum amount of habitat needed (Suzin et al. 2017; Gonçalves et al. 2022). Taking advantage of anthropic resources, such as domestic-farm animals and their related items, can be essential to capuchins' maintenance in anthropogenic environments.

Human-capuchin interactions are expected to increase, whether in native, rural, or urban environments, as habitat loss increases. In native-rural areas, capuchins monkeys benefit from crop-raiding (Freitas et al. 2008; Lins & Ferreira 2019). Nonetheless, they can be considered crop pests (Rocha & Fortes 2015; Spagnoletti et al. 2017; Di Bitetti 2019; Ludwig et al. 2022), which can result in their killing (Liebsch & Mikich 2017). In urban areas, human-capuchin monkey interactions are relatively common. Under these circumstances, capuchins monkeys benefit from human provisioning (Suzin et al. 2017; Gonçalves et al. 2022), which can habituate the animals to human food or human resources. The subsequent dependence on human resources is so relevant that it can affect the social structure of capuchin monkey groups (Back et al. 2019; Lousa et al. 2022). The dependency on anthropic resources also intensifies human-capuchin interactions. This dependency reaches the point of the house

"visiting" by capuchins monkeys (Santos & Martinez 2015; Suzin et al. 2017) and even physical attacks on humans in order to obtain food (Santos & Martinez 2015). Since capuchins monkeys are very plastic, this heightened interaction may intensify crop attack (see Peixoto-Couto et al. 2021).

In any scenario, capuchins monkeys can suffer retaliation due to outbreaks of zoonoses or pest control (crops and domestic animals) (Humle & Hill 2016). Future research may draw attention to these potential new dimensions of threat to capuchin monkeys. As these monkeys increase the consumption of anthropogenic resources (domestic animals), they may also increase any threat of retaliation from local residents, including killing. Likewise, future research may draw attention to the minimum area to support groups of capuchin monkeys without exhausting the carrying capacity. Increased consumption of anthropogenic resources may be an artifact of habitat reduction along with an interface with human settlements and activities. This can lead to local extinction or favor the consumption of anthropogenic resources by capuchins monkeys, especially those with high energetic value.

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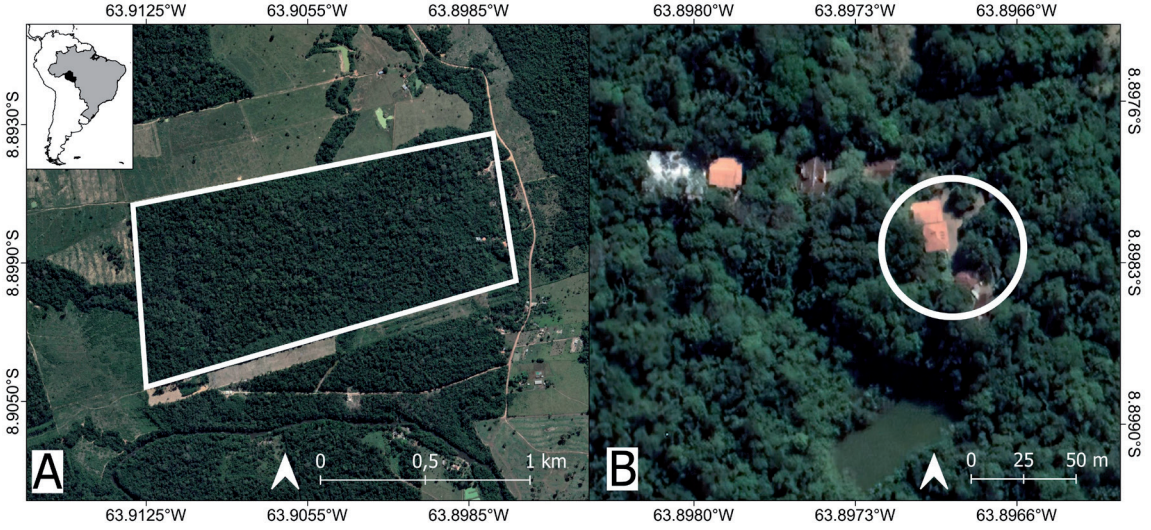


**Figure 1.** Location of Centro de Cultura e Formação Kanindé (CCFK). A) General location of the forest remnant where the CCFK is located; B) location where the nest predation was recorded.

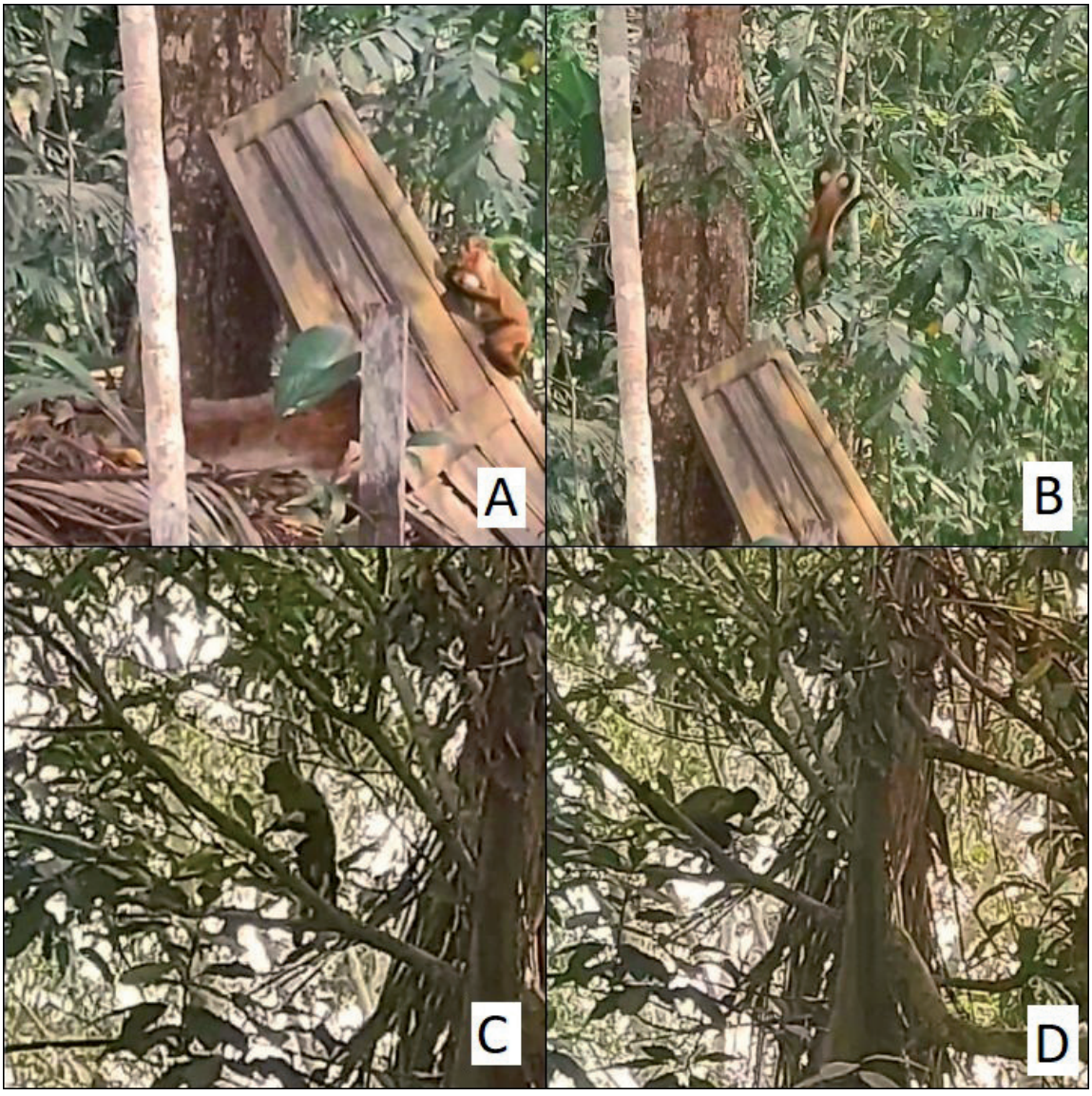


**Figure 2.** Young individual *Sapajus apella* carrying the eggs (A, B) for later consumption in isolation (C, D).

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